

Abstract

A surface-spintronic device operating on a novel principles of operations may be implemented as a spin conducting, a spin switching or a spin memory device. It includes a magnetic atom thin film (13) layered on a surface of a solid crystal (12) and a drain and a source electrodes (14) and (15) disposed at two locations on the magnetic atom thin film, respectively, whereby a spin splitting surface electronic state band formed in a system comprising said solid crystal(12) surface and said magnetic atom thin film (13) is utilized to obtain a spin polarized current flow. With electrons spin-polarized in a particular direction injected from the source electrode (15), controlling the direction of magnetization of the magnetic atom thin film (13) allows switching on and off the conduction of such injected electrons therethrough. Also, with the use of the magnetization holding function of the magnetic atom thin film (13), it is possible to realize a spin memory device that can operate to write information on controlling the direction of magnetization of the magnetic atom thin film (13) and that can operate to read information on detecting the state of conduction or nonconduction between the source and drain electrodes (15, 14).